

WHAT IS CLAIMED IS:

1. A low-profile catheter valve, comprising:  
a catheter having a central lumen, the catheter including a plurality of longitudinal struts and longitudinal apertures, the struts and apertures interspaced around the circumference of a proximal portion of the catheter; and  
a self-sealing polymer disposed on at least a portion of each strut, the polymer separably sealing the struts one to another, wherein the struts separate to allow passage of a fluid into or out of the central lumen, and wherein the struts reseal to prevent passage of a fluid into or out of the central lumen.
2. The valve of claim 1 wherein the self-sealing polymer is disposed on at least a first side surface and a second side surface of each strut, and wherein separably sealing the struts one to another comprises separably sealing the first side surface of each strut to the second side surface of an adjoining strut, thereby closing the apertures.
3. The valve of claim 2 wherein a proximal end of the central lumen is sealed proximal to the apertures.
4. The valve of claim 2 wherein the struts are deformed into the central lumen of the catheter such that a narrowed region is formed in the catheter, the narrowed region including a narrowed lumen.
5. The valve of claim 4 wherein the self-sealing polymer is further disposed on at least an inner surface of each strut, and wherein separably sealing the struts one to another further comprises separably sealing the inner surface of each strut to the inner surface of at least one opposing strut, thereby closing the narrowed lumen.

6. The valve of claim 5 further comprising:  
an elastic coating disposed over an outer surface of the narrowed region of the catheter.
7. The valve of claim 5 wherein the struts separate in response to inserting a needle into the narrowed lumen, and wherein the struts reseal in response to withdrawing the needle from the narrowed lumen.
8. The valve of claim 5 wherein the struts separate in response to inserting a rod into the narrowed lumen, and wherein the struts reseal in response to withdrawing the rod from the narrowed lumen.
9. The valve of claim 1 wherein the struts separate in response to applying a mechanical force to the proximal portion of the catheter, and wherein the struts reseal in response to withdrawing the mechanical force.
10. The valve of claim 9 further comprising:  
an adaptor that may be removably mounted about the proximal portion of the catheter, the adaptor being movable between a first position in which a mechanical force is applied to the proximal portion of the catheter and a second position in which the mechanical force is withdrawn, the adaptor being in fluid communication with a fluid delivery device, the adaptor having a seal to engage the circumference of the catheter distal to the proximal portion of the catheter, wherein engaging the seal establishes a fluid-tight chamber surrounding the proximal portion of the catheter.

11. The valve of claim 9 further comprising:

an adaptor that may be removably mounted on the proximal portion of the catheter, the adaptor being movable between a first position in which a mechanical force is applied to the proximal portion of the catheter and a second position in which the mechanical force is withdrawn, the adaptor being in fluid communication with a fluid delivery device, the adaptor having a first seal to engage the circumference of the catheter distal to the proximal portion of the catheter, the adaptor having a second seal to engage the circumference of the catheter proximal to the proximal portion of the catheter, wherein engaging the first and second seals establishes a fluid-tight chamber surrounding the proximal portion of the catheter.

12. The valve of claim 1 wherein the apertures are narrowly eye-shaped.

13. The valve of claim 1 wherein the apertures are hexagonal.

14. The valve of claim 1 wherein the catheter is a hollow guidewire.

15. The valve of claim 1 wherein an inflatable balloon is operably attached to a distal portion of the catheter, and wherein the struts separate to allow inflation of the balloon through the central lumen of the catheter, reseal to maintain inflation, and separate to allow deflation of the balloon.

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16. A system for treating a vascular condition, comprising:
  - a catheter having a central lumen, the catheter including a plurality of longitudinal struts and longitudinal apertures interspaced around the circumference of a proximal portion of the catheter;
  - a self-sealing polymer disposed on at least a portion of each strut, the polymer separably sealing the struts one to another; and
  - an inflatable balloon operably attached to a distal portion of the catheter, wherein the struts separate to allow inflation of the balloon through the central lumen of the catheter, reseal to maintain inflation, and separate to allow deflation of the balloon.
17. The system of claim 16 wherein the catheter is a hollow guidewire.
18. The system of claim 16 wherein the self-sealing polymer is disposed on at least a first side surface and a second side surface of each strut, and wherein separably sealing the struts one to another comprises separably sealing the first side surface of each strut to the second side surface of an adjoining strut, thereby closing the apertures.
19. The system of claim 18 wherein a proximal end of the central lumen is sealed proximal to the apertures.
20. The system of claim 18 wherein the struts are deformed into the central lumen of the catheter such that a narrowed region is formed in the catheter, the narrowed region including a narrowed lumen.

21. The system of claim 20 wherein the self-sealing polymer is further disposed on at least an inner surface of each strut, and wherein separably sealing the struts one to another further comprises separably sealing the inner surface of each strut to the inner surface of at least one opposing strut, thereby closing the narrowed lumen.

22. The system of claim 21 further comprising:  
an elastic coating disposed over an outer surface of the narrowed region of the catheter.

23. The system of claim 16 wherein the struts separate in response to applying a mechanical force to the proximal portion of the catheter, and wherein the struts reseal in response to withdrawing the mechanical force.

24. The system of claim 23 further comprising:  
an adaptor that may be removably mounted on the proximal portion of the catheter, the adaptor being movable between a first position in which a mechanical force is applied to the proximal portion of the catheter and a second position in which the mechanical force is withdrawn, the adaptor being in fluid communication with a fluid delivery device, the adaptor having a seal to engage the circumference of the catheter distal to the proximal portion of the catheter, wherein engaging the seal establishes a fluid-tight chamber surrounding the proximal portion of the catheter.

25. The system of claim 23 further comprising:

an adaptor that may be removably mounted on the proximal portion of the catheter, the adaptor being movable between a first position in which a mechanical force is applied to the proximal portion of the catheter and a second position in which the mechanical force is withdrawn, the adaptor being in fluid communication with a fluid delivery device, the adaptor having a first seal to engage the circumference of the catheter distal to the proximal portion of the catheter, the adaptor having a second seal to engage the circumference of the catheter proximal to the proximal portion of the catheter, wherein engaging the first and second seals establishes a fluid-tight chamber surrounding the proximal portion of the catheter.

26. The system of claim 21 wherein the struts separate in response to inserting a hollow needle into the narrowed lumen.

27. The system of claim 21 wherein the struts separate in response to inserting a rod into the narrowed lumen.

28. The system of claim 16 wherein the apertures are narrowly eye-shaped.

29. The system of claim 16 wherein the apertures are hexagonal.

30. A method for manufacturing a low-profile catheter valve, comprising:

forming a plurality of longitudinal apertures and longitudinal struts into a proximal portion of a catheter; and  
applying a self-sealing polymer to at least a portion of each strut.

31. The method of claim 30 further comprising:  
prior to applying the self-sealing polymer, compressing the struts into a central lumen of the catheter such that a narrowed region is formed in the catheter, the narrowed region having a narrowed lumen.
32. The method of claim 31 further comprising:  
prior to applying the self-sealing polymer, heating the narrowed region of the catheter to maintain compression of the struts into the central lumen of the catheter.
33. The method of claim 30 wherein applying a self-sealing polymer to at least a portion of each strut comprises:  
bowing the struts into an outwardly extending position; and  
coating the polymer onto at least a portion of each strut.
34. The method of claim 31 further comprising:  
after applying the self-sealing polymer, applying an elastic coating over an outer surface of the narrowed region of the catheter.